A Marshall Cavendish Collection

EVERY FORTNIGHT

QUEST

ADVENTURES IN THE WORLD OF SCIENCE

FORCES

45

GIANT WEIGHT-LIFTING POSTER

SCIENTIFIC PROJECTS

PLUS MORE Q & A CARDS

FACT FILES ON:

- Magnetism
- Tornadoes, hurricanes and whirlpools
- Muscle power
- Testing to destruction
- Explosives
- The Sun
- Nature's electricity

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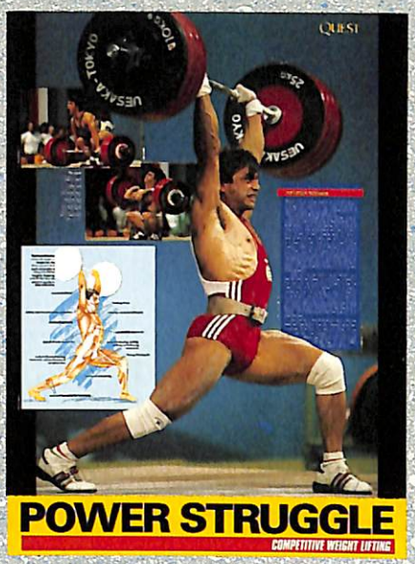
INSIDE THIS PACK

FACT FILES

▶ The Sun's nuclear furnace ▶ Lightning ▶ Global air circulation ▶ The body's muscles ▶ Explosions ▶ Vehicle testing tracks ▶ Magnetic storms

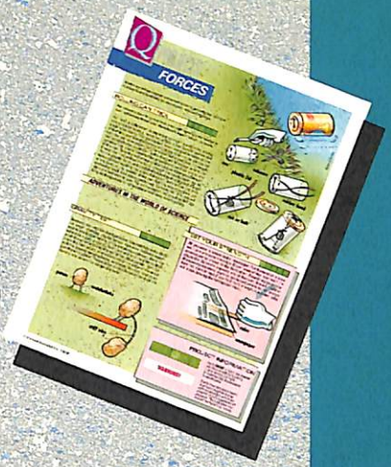
More In-Quest Q & A cards



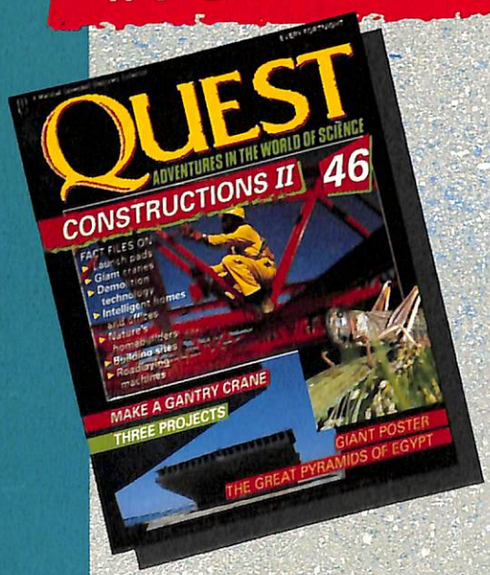
POSTER

The power lifters

THREE EXPERIMENTS

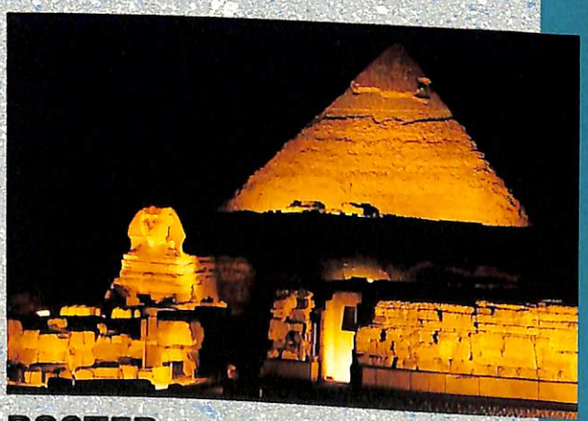


IN QUEST 46 CONSTRUCTIONS II



FACT FILES INCLUDE:

▶ Building sites
▶ Crane technology
▶ Intelligent buildings
▶ Demolition
▶ Rocket launch pads
▶ Road making



POSTER

The pyramids of Egypt

MODEL

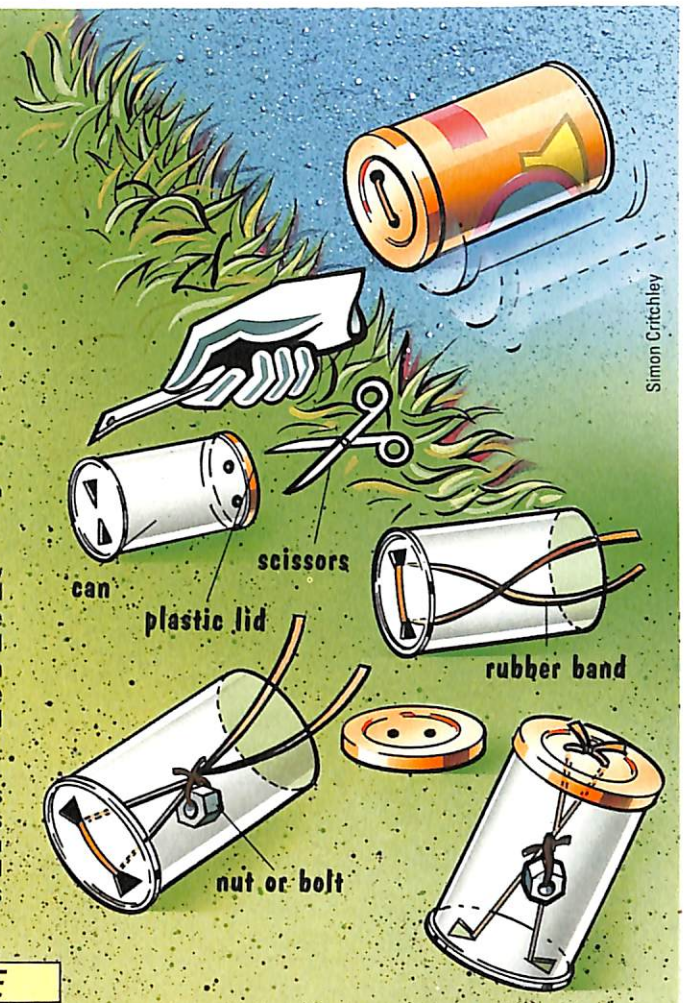
The gantry crane

ISSN 1350-3766

PROJECTS

FORCES

Make a rolling object apparently defy gravity by using a rubber band's ability to store and release energy.



Simon Critchley

ROLLING CAN TRICK

1 2 **3** 4 5

An elastic band can store enough energy to make a can roll away from you then back again all on its own.

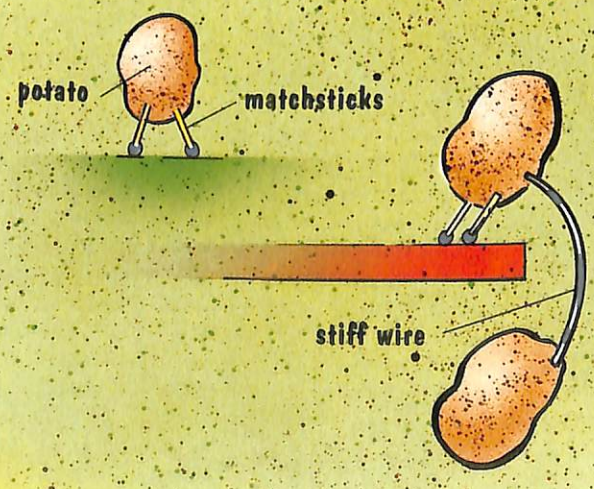
You need a coffee can or any other can with a plastic lid, a long, strong rubber band, a heavy nut or bolt, a can 'punch' opener and a pair of scissors. First punch two holes in opposite sides of one end of the can. Carefully make matching holes in the plastic lid with the pair of scissors. Cut the rubber band and feed it through the bottom holes, as shown in the diagram. Measure where the centre of the elastic band will be when stretched from end to end of the can. Knot the bolt or nut at this spot so it hangs as shown. Thread the free ends of the band through the two holes in the lid. Put the plastic lid on and stretch the band so that the bolt hangs freely without touching the sides of the can. Then secure the ends of the band on the outside of the can. Roll the can away from you on level ground. As it slows down, say, 'Come to me'. The can will stop and roll back to you. You can even roll the can downhill (as long as the gradient is not too steep) and make it defy gravity.

ADVENTURES IN THE WORLD OF SCIENCE

GRAVITY TEST

1 **2** 3 4 5

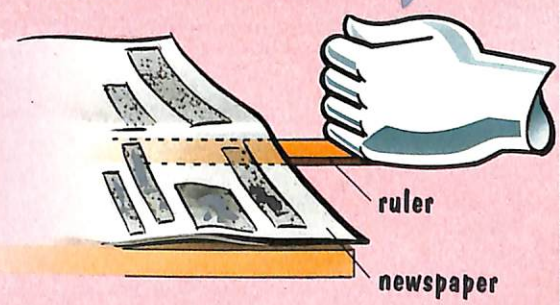
You need two medium-sized potatoes, two matches and a 20-25 cm length of strong, clothes hanger type wire. Push the matches into the bottom of one of the potatoes as shown. Bend the wire into a gentle curve. Push one end into the potato, then push the other end into the top of the other potato. Now balance the first potato on the matches at the edge of the table, with the second hanging below as shown. You may have to adjust the wire a little. The potatoes should balance because the second one lowers the centre of gravity.



TEST YOUR STRENGTH

1 **2** 3 4 5

All you need is a ruler and a newspaper. Put the ruler on a table with one end over the edge. Cover most of the ruler with the newspaper as shown in the illustration. Then bring your hand down sharply on the exposed end of the ruler. You will find that the newspaper stays in place because it soaks up the energy from the blow. In fact, if you hit it hard enough, a wooden ruler will break, leaving the newspaper intact.



PROJECT INFORMATION

1 2 **3** 4 5

Each **QUEST** project and model has its own difficulty rating: 1 very simple, 2 simple, 3 intermediate, 4 advanced, 5 complicated.

WARNING!

Every care has been taken to ensure projects are as safe as possible. However, parents should supervise all projects. The publisher can accept no liability for injury.

DATAQUEST

INVENTIONS: INVENTION OF MACHINES

Item	Year	Inventor
adding machine	1623	William Schickard (Ger)
aeroplane	1903	Orville and Wilbur Wright (US)
ball-point pen	1888	John L Loud (US)
battery	1800	Alessandro Volta (It)
bicycle	1839	Kirkpatrick Macmillan (Scot)
cellophane	1908	Dr Jacques Brandenberger (Switz)
disc brake	1902	Dr F Lanchester (GB)
electronic computer	1943	Dr Alan M Turing (GB)
helicopter	1924	Etienne Oehmichen (Fr)
jet engine	1937	Sir Frank Whittle (GB)
laser	1960	Dr Charles H Townes (US)
nylon	1937	Dr Wallace H Carothers (US)
plastics	c.1852	Alexander Parks
spectacles	1289	Venice, Italy
sticky tape	1930	Richard Drew (US)
submarine	1776	David Bushnell (US)
telephone	1849	Antonio Meucci (It)
transistor	1948	J. Bardeen, W. Shockley and W. Brattain (US)
wheel	c.3300 BC	Sumerian civilization
zip fastener	1891	Whitcomb L Judson (US)

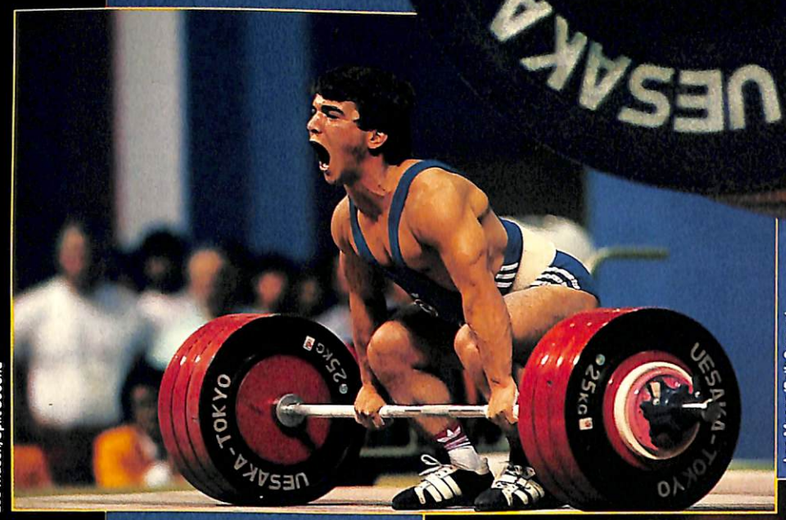
TOOLS: SOME COMMON TYPES OF HAMMERS

Name of hammer	Type of use
brick hammer	work with brick and stone
club hammer	heavy work in the building trade
claw hammer	rougher types of carpentry and joinery in the building trade where nails might need to be withdrawn as well as driven home
ball-pein hammer	an engineer's hammer. The semi-spherical pein is used for peining or bending over metal and for other metal working jobs
Warrington hammer	lighter woodwork jobs by joiners. The straight pein opposite the striking face is useful when starting a panel pin

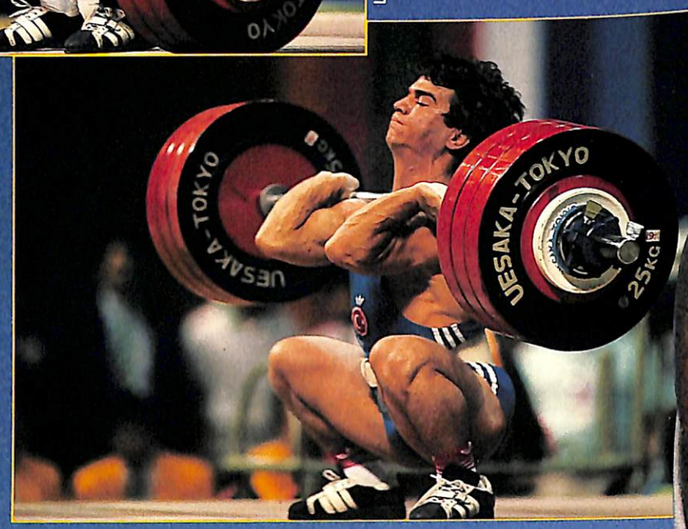
FORCES: THE FORCES OF PHYSICS

Force	Range	Particle	Effect
gravity	very long	graviton	acts on all matter but weak within the atom
weak force	short, about 10^{-15}cm	W-meson	acts on all basic particles, leptons and quarks and is involved in radioactive processes
electromagnetic force	very long	photon	acts on all charged particles and provides the basis to the reactions of chemistry and biology
strong force	short, 10^{-13}cm	meson	acts on the hadrons (eg proton and neutron) and is responsible for binding the nucleus together. It is invloved in nuclear reactions
colour force	short, 10^{-13}cm	gluon	acts on the quarks, allowing them freedom of movement within the hadron but holding them firmly within it

QUEST

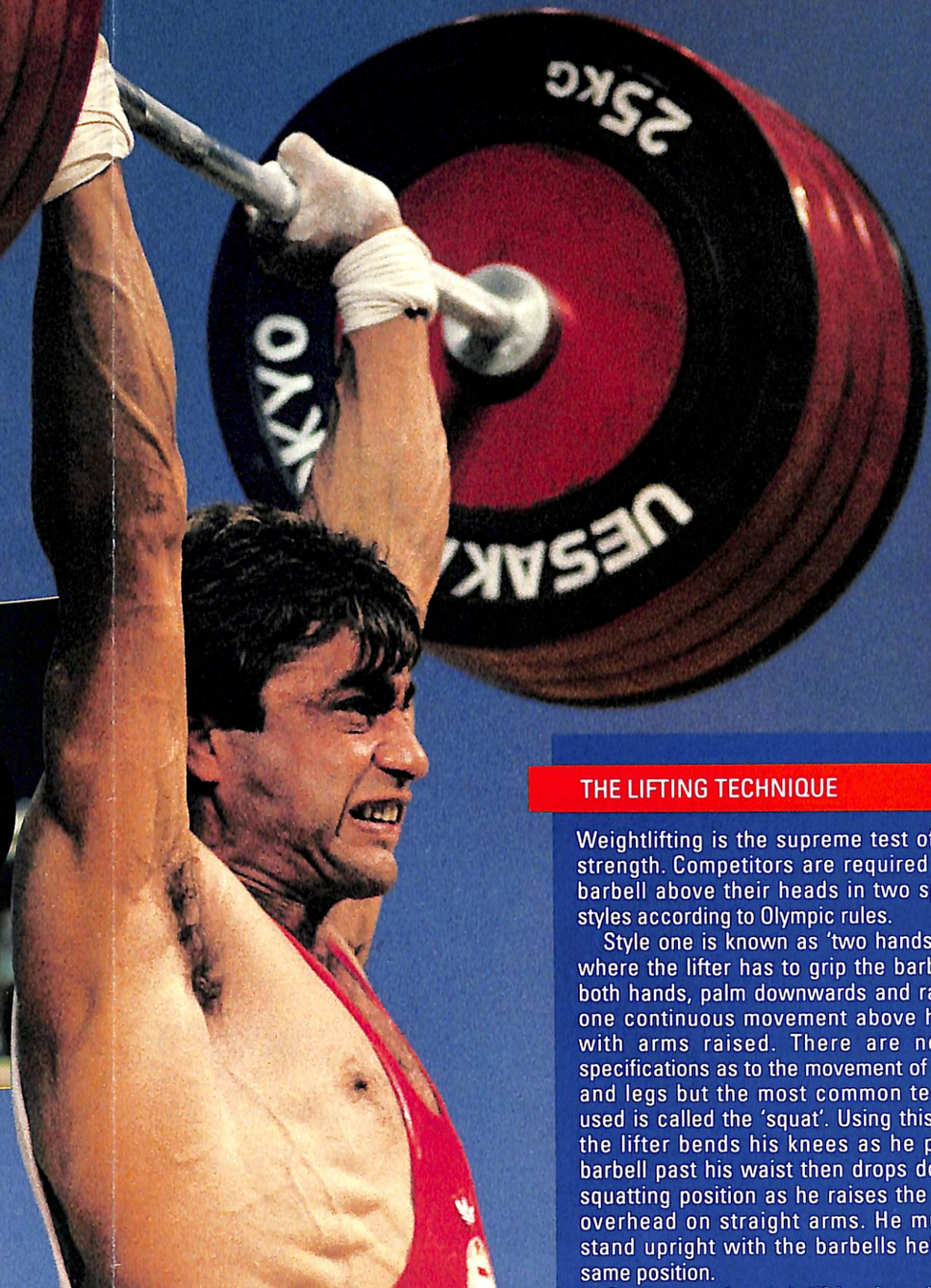


Leo Mason/Split Second



***The 'squat technique'**, being used by Naim Suleymanoglu of Turkey as a preliminary to a 'two hands clean and jerk lift'. Suleymanoglu became the youngest world record holder in 1983 when he was only 15 years and 123 days old.*

***Total coordination** of muscle power is needed for the three minutes that each competitor is allowed to lift the weights. Stepping*



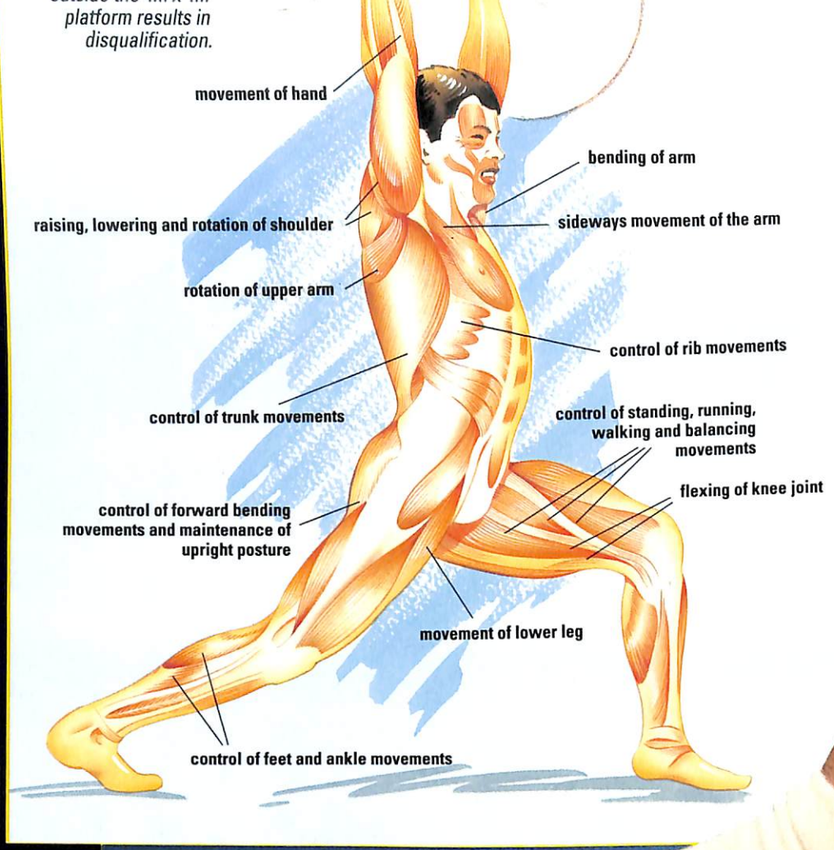
THE LIFTING TECHNIQUE

Weightlifting is the supreme test of human strength. Competitors are required to lift a barbell above their heads in two specified styles according to Olympic rules.

Style one is known as 'two hands snatch' where the lifter has to grip the barbell with both hands, palm downwards and raise it in one continuous movement above his head with arms raised. There are no exact specifications as to the movement of his body and legs but the most common technique used is called the 'squat'. Using this method the lifter bends his knees as he pulls the barbell past his waist then drops down in a squatting position as he raises the barbells overhead on straight arms. He must then stand upright with the barbells held in the same position.

Style two of weightlifting is called 'two

disqualification.



Joe Lawrence

Mike Powell/Allsport

the weights being directly raised above the head they are first raised in one clean movement to the shoulders , then jerked to arms length overhead. Most lifters use the 'split' technique for this manoeuvre, where one foot is thrust forward and the other foot backward to gain impetus as the barbell is lifted. Both feet must then be placed in a straight line.

The winner is the competitor who lifts the heaviest weights in the two categories added together. The Olympic record holder in the super heavyweight division is Alexander Kourlovitch who lifted 132.20 kg at the 1988 Olympics in Seoul.

POWER STRUGGLE

COMPETITIVE WEIGHT LIFTING

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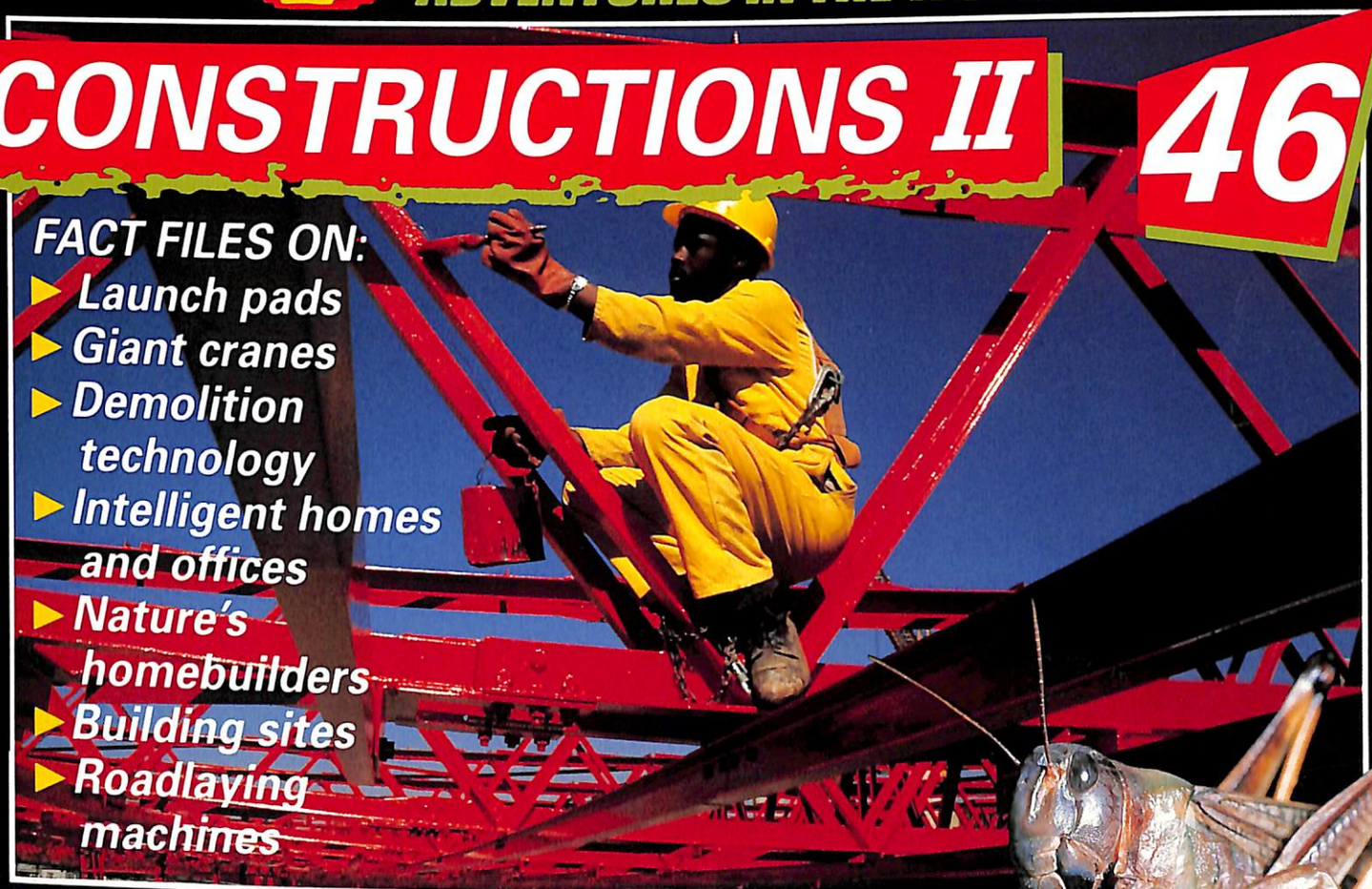
ADVENTURES IN THE WORLD OF SCIENCE

CONSTRUCTIONS II 46



FACT FILES ON:

- Launch pads
- Giant cranes
- Demolition technology
- Intelligent homes and offices
- Nature's homebuilders
- Building sites
- Roadlaying machines

MAKE A GANTRY CRANE

THREE PROJECTS

GIANT POSTER

THE GREAT PYRAMIDS OF EGYPT

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